

AMATEUR RADIO DIGITAL COMMUNICATIONS

Roadmap & Grantee Forum

Hamvention 2025 • Xenia, OH

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Agenda

- Introductions
- ARDC Vision & Strategy
- 44Net Updates
- Grantee Forum
- Q&A



Illini Solar Car

Introductions



Vision & Strategy

**Promote
Learning**

**Promote
Experimenting**

**Promote
Doing**

Origins

[RFC 790](#)

September 1981
Assigned Numbers

Network Numbers

036.rrr.rrr.rrr	SU-NET	Stanford University Ethernet	[MRC]
037.rrr.rrr.rrr	DECNET	Digital Equipment Network	[DRL]
038.rrr.rrr.rrr	DECNET-TEST	Test Digital Equipment Net	[DRL]
039.rrr.rrr.rrr	SRINET	SRI Local Network	[GE0F]
040.rrr.rrr.rrr	CISLNET	CISL Multics Network	[CH2]
041.rrr.rrr.rrr	BBN-LN-TEST	BBN Local Network Testbed	[KTP]
042.rrr.rrr.rrr	S1NET	LLL-S1-NET	[EAK]
043.rrr.rrr.rrr	INTELPOST	COMSAT INTELPOST	[DLM1]
044.rrr.rrr.rrr	AMPRNET	Amature Radio Experiment Net	[HM]
044.rrr.rrr.rrr-126.rrr.rrr.rrr		Unassigned	[JBP]
127.rrr.rrr.rrr		Reserved	[JBP]



AMATEUR RADIO DIGITAL COMMUNICATIONS

A Little History

1981	Hank Magnuski KA6M and 44Net / AMPRNet
2011	Formation of ARDC to be the trustee of the 44Net address space by Brian Kantor WB6CYT
2019	Sale of IPv4 addresses & creation of endowment to fund ARDC operations and grants
2019	Sudden passing of WB6CYT
2020	Building a staff to manage operations including grants and technology

Mission

To support, promote, and enhance digital communication and broader communication science and technology, to promote Amateur Radio, scientific research, experimentation, education, development, open access, and innovation in information and communication technology.



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But why, tho? To what end?



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Philosophical & Practical Questions

- What do we mean by *digital communications*?
- Why open source? How does relate to amateur radio?
- **What are we really trying to do here, anyway?**

Vision Statement

A thriving global community of learners, experimenters, and contributors advancing freedom with open source communication and information technology.

<https://www.ardc.net/about/vision/>

Vision Statement

A thriving global community of learners, experimenters, and contributors advancing freedom with open source communication and information technology.

We aim to enable all people, everywhere, to collaborate in a way that crosses borders and fosters international goodwill.

Vision Statement

A thriving global community of learners, experimenters, and contributors advancing freedom with open source communication and information technology.

Everyone has the right to learn, experiment, and contribute to collaboratively and peacefully building the technologies and communities they wish to see in the world.

Vision Statement

*A thriving global community of learners, experimenters, and contributors **advancing freedom** with open source communication and information technology.*

- Freedom to tinker and build with little or no gatekeeping
- Freedom to communicate & share information, in service of assisting others
- We believe in the power of Free Software to enable **learning, experimenting, and doing** by all people, everywhere, in a way that proprietary products and software generally do not.

Vision Statement

A thriving global community of learners, experimenters, and contributors advancing freedom with open source communication and information technology.

- By eliminating gatekeeper technology, we enable makers, hackers, and developers to learn, experiment, and deploy using freely available knowledge, tools, and platforms.
- We focus on areas of AR and DC that are less likely to be funded than commercial applications.

High-Level Strategies

Promote Learning

Goal: more people learning about AR and DC.

Promote Experimenting

Goal: more people experimenting, innovating, and developing new AR and DC technology.

Promote Doing

Goal: more people using additional and new bands, modes, & technologies (AR & DC).



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1. Promote Learning

Goal: more people learning about AR and DC

- Any age
- Any competency level
- Inside & outside traditional classrooms

#LifelongLearning!



Youngsters on the Air (YOTA)

2. Promote Experimenting

Goal: more people exploring, innovating, and advancing tech

- Hacking & research
- Newbie exploration: specific ham bands or non-amateur wireless
- Technology widgets & electronic kit building
- From tinkering to deep dives



3. Promote Doing

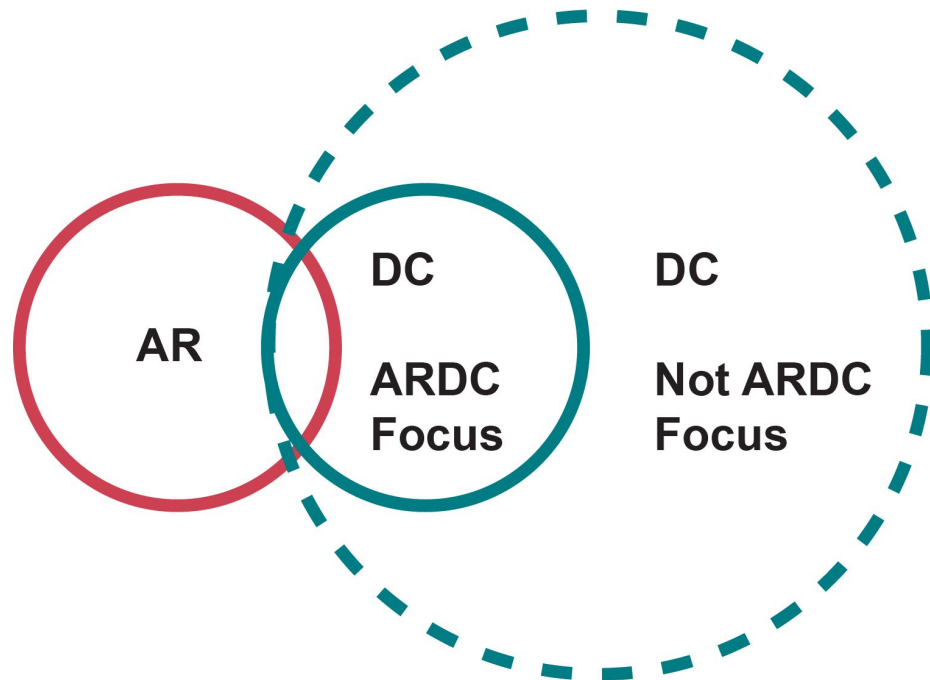
Goal: more people using new tech productively within AR and DC

- Real world use & impact
- Engagement with users (incl. healthy feedback loop)
- Spectrum – use it or lose it! Including:
 - AR, lightly licensed, unlicensed, & non-commercial spectrum
 - Wireline



WX5FWD SKYWARN

Focus Area in DC



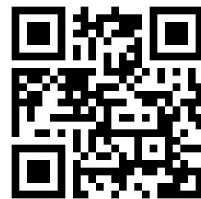
- Hams + hackers
- Unlicensed spectrum
- 44Net education & experimentation

We also care about...

- ✓ No gatekeeper technologies
- ✓ Broad impact (open, shareable, leverageable)
vs. serving a single group
- ✓ Not likely to be funded by other sources
- ✓ Not just wireless

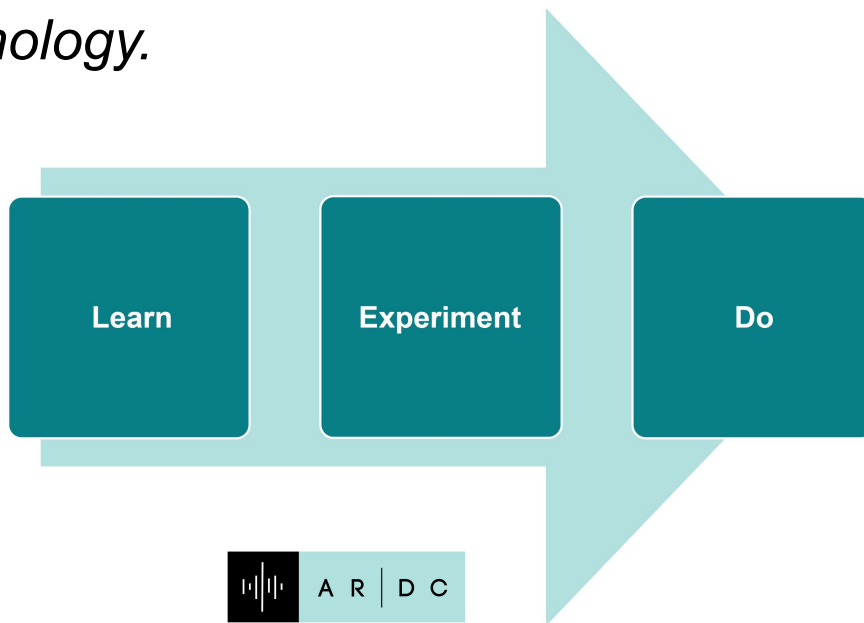
Priority Areas for Funding

- **R&D:** Low-cost, open solutions – e.g. codecs, SDR transmitters, modulation techniques.
- **Space-Based Comms:** New or enhanced sat comms tech – e.g. GEO or HEO programs, repurposed commercial sats, space-based tools for learning.
- **Open Source Education:** Filling gaps in AR & DC resources – e.g. curricula, videos, hands-on projects.



Vision & Roadmap

A thriving global community of learners, experimenters, and contributors advancing freedom with open source communication and information technology.

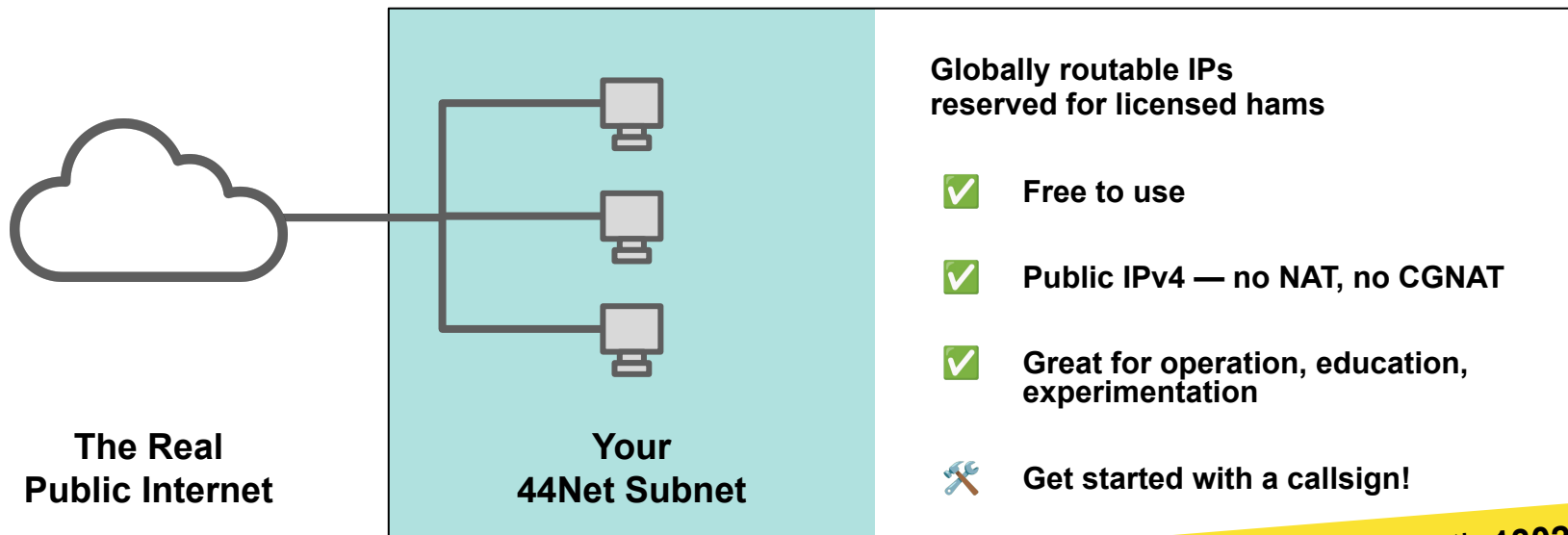


Technology & 44Net



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44Net: Real IPv4 for Real Hams



Learn more at booth 1302!



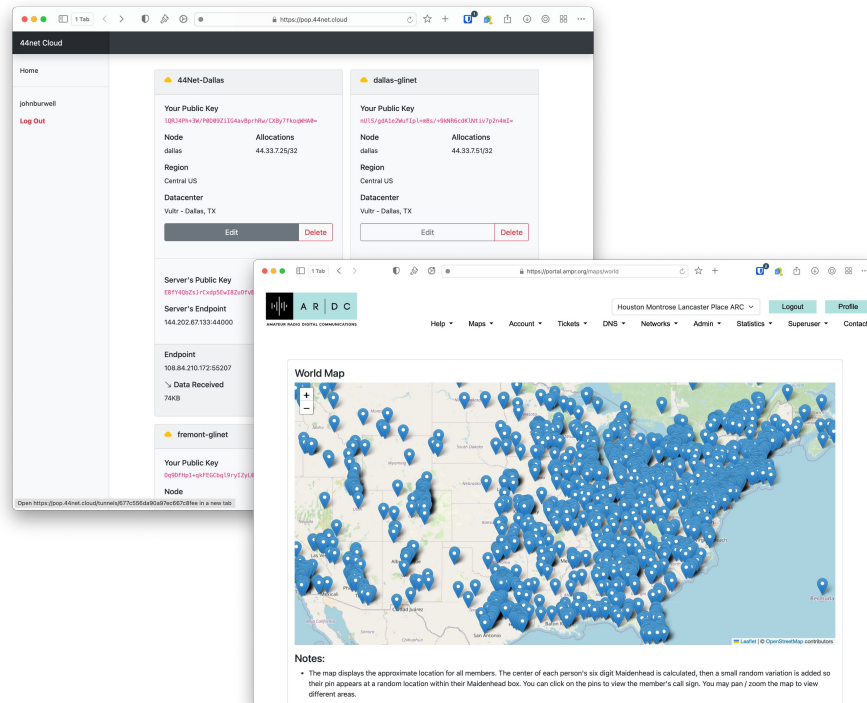
What's New at 44Net

New Portal: portal.ampr.org

- Self-service
- Orgs and club support
- Callsign DNS subdomains

Volunteer Engagement:

- RCs and Ticket Handlers supporting users
- TAC PoP Team launching VPN
- TAC Docs Team refreshing wiki.ampr.org
- UCSD gateway upgrade (Tim Požar, et al.)



Discover 44Net

Booth 1302!

Live Display

Remote HF Operation
Mobile Hotspot
End-to-end 44Net

Sign Up in Minutes

VPN, Mesh, BGP
No NAT, just Net
Take Home an IP!

Talk With Us!

Use Cases
Projects
Ideas, Tech, Community

Grantee Forum



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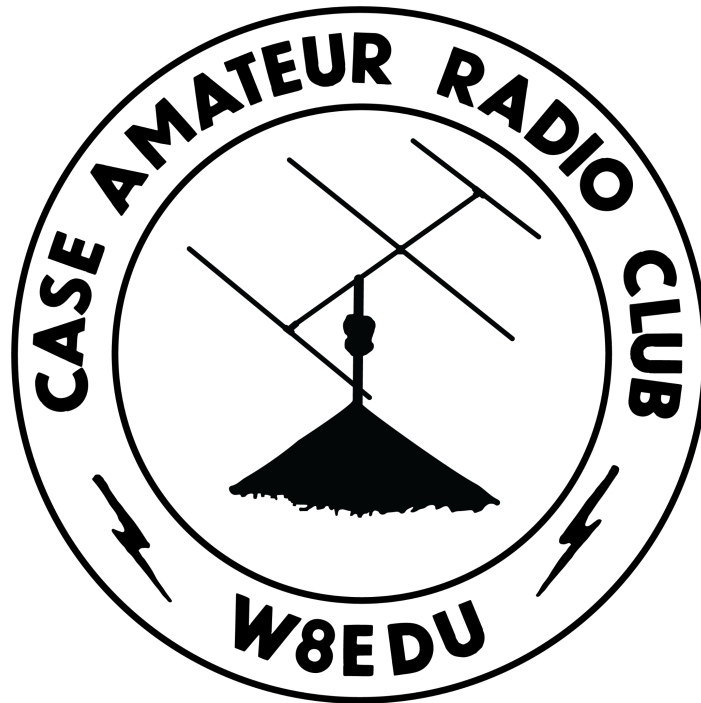
Case Amateur Radio Club



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Case Amateur Radio Club W8EDU

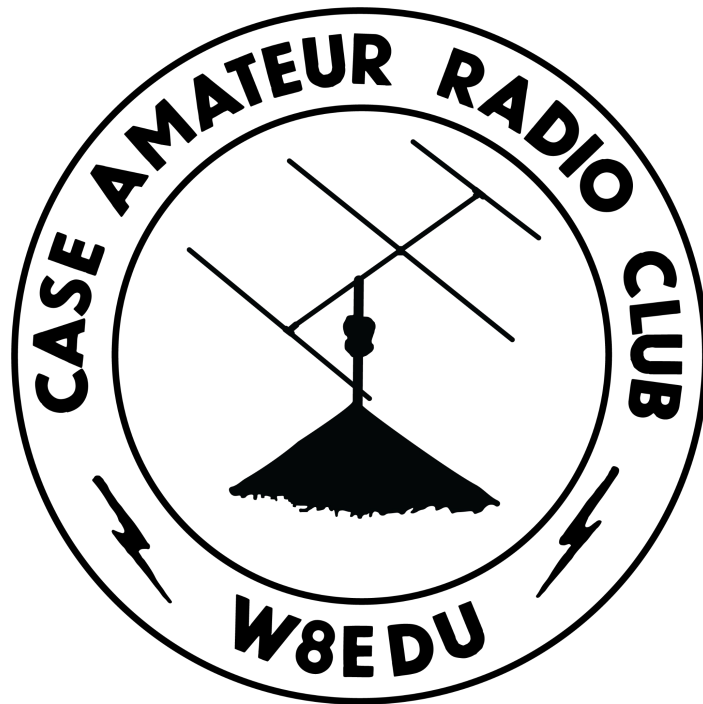
- Student organization dedicated to:
 - Amateur radio education
 - Research
 - Community engagement
- Club was re-established 15 years ago
 - Motivation? I just wanted pizza...



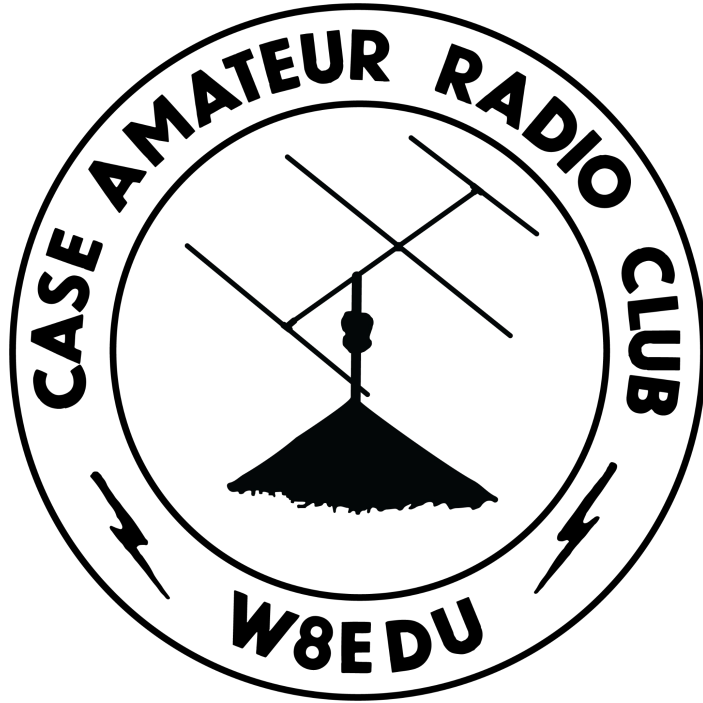
W8EDU Project Updates

ARDC funds have allowed us to:

- Support a large number of Senior Projects
- Supported a large number of students working on graduate degrees
- Accomplished curriculum integration with multiple classes in the School of Engineering



W8EDU: Talk to Us!



- Visit our booth: *Stalls 9605, 9606 in Flea Market*
- Members of our club can also be found at:
 - ARRL Collegiate Booth: *Building 2 (Tesla)*
 - HamSCI Booth: *Building 5 (Hertz), Booth 5008*
- Email:
 - Nathaniel: nnv@case.edu
 - David: dxk10@case.edu

FreeDV



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What is FreeDV?

- Free, open-source, high quality digital HF voice mode unencumbered by patents
 - Comparable to:
 - Current patented offerings used in the amateur radio community
 - DVSI's AMBE codec as used in D-STAR, DMR and Yaesu System Fusion
 - Current offerings unable to be used on HF

FreeDV



Digital Voice



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What is FreeDV?

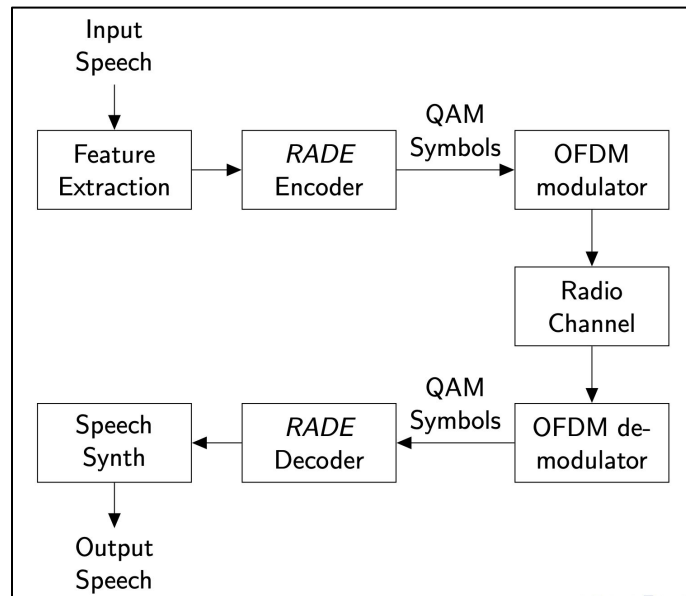
Hams familiar with digital modes can set up FreeDV like WSJT-X for FT-8 and can rapidly rapidly make contacts

FreeDV Reporter											
Active Stations	Chat (163)	Calling Frequencies									
Callsign **	Locator **	Version **	Frequency **	Status **	Message **	TX Mode **	Last TX **	RX Callsign **	RX Mode **	SNR **	Last Update **
GBSEZ	IO92tc	FreeDV 2.0.0-dev2-a32be	3.6430 MHz	Receiving	Monitor/report only - no op - app development ⚠	RADEV1	--	--	--	--	4/30/2025 7:05:57 AM
AC6RB	DM13do	FreeDV 2.0.0-dev2	14.2360 MHz	Receiving	WhatsApp = +19493578062	RADEV1	--	--	--	--	4/30/2025 2:36:55 AM
W7NC	DN17gq	FreeDV 2.0.0-dev2	14.2360 MHz	Receiving	--	RADEV1	--	--	--	--	4/30/2025 7:05:57 AM
JF1GHJ	PM95ss	FreeDV 2.0.0-dev2	3.5790 MHz	Receiving	TEST MONITOR テスト モニター	RADEV1	--	--	--	--	4/30/2025 7:05:58 AM
JA1VMP	QM06Fi	FreeDV 2.0.0-dev2	7.1770 MHz	Receiving	--	RADEV1	--	--	RADEV1	6	4/30/2025 7:06:00 AM
K6AQ	DM12kw	FreeDV 2.0.0-dev2-9b84	28.3300 MHz	Receive Only	No RX - Testing PR#861 (Linux)	N/A	N/A	--	--	--	4/30/2025 3:53:17 AM
JA3JHG	PM85AC	FreeDV 2.0.0-dev2	3.7630 MHz	Receiving	--	700D	4/30/2025 6:20:57 AM	--	--	--	4/30/2025 7:05:58 AM
9V1AZ	OJ11	FreeDV 2.0.0-dev2	21.3130 MHz	Receiving	--	RADEV1	4/30/2025 5:56:32 AM	--	--	--	4/30/2025 7:05:56 AM
J13LDJ	PM74vw	FreeDV 2.0.0-dev2	3.5790 MHz	Receive Only	APO確認 https://tloz.main.jp/FreeDV/	N/A	N/A	--	--	--	4/30/2025 6:55:18 AM
JL1HHL	QM05CD	FreeDV 2.0.0-dev2	7.1770 MHz	Transmitting	katsuura city chiba	RADEV1	4/30/2025 7:04:24 AM	--	--	--	4/30/2025 7:05:58 AM
LU2EP	gf05op	FreeDV 2.0.0-dev2	7.1770 MHz	Receiving		RADEV1	--	--	--	--	4/30/2025 7:00:26 AM

<https://qso.freedv.org>

FreeDV Project Goals/Updates

- Improve FreeDV codec:
 - Work at lower S/N ratios than current offerings
 - Improve audio quality
 - **Result:** Improved audio quality with Radio Autoencoder (RADE) mode
- <https://freedv.org/davids-freedv-update-september-2024/>



FreeDV Project Goals/Updates

Work with commercial manufacturers to integrate codec into new/existing radios

- Early work (ezDV, <https://freedv.org/ezdv>) lacks RADE-capable hardware and only supports existing modes
 - Full hardware design was handed off to TAPR for online store sales
- **Promote the use of FreeDV**



FreeDV: Talk to Us!

FreeDV



Digital Voice

- Visit our booth: *Building 1 (Maxim), Booth 1909*
- Digital Modes Forum
 - Saturday (5/17), 9:15am, Room 4
- Email:
 - Mooneer: mooneer@gmail.com
- Have contacts with commercial manufacturers?
 - We're interested in speaking with folks that could help us with codec integration



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MMDVM

What is MMDVM?

- **Multi-Mode Digital Voice Modem (MMDVM):** designed to give users access to digital voice modes in a more personal way
- MMDVM divides allow users to access modes and reflectors they desire without having to wait for local repeaters to be installed or play by the repeater owner's rules
- Devices allow for some cross mode operations, letting users try different modes without having to purchase new radios
- MMDVM is an open source project: users can look at the code and make pull requests to improve the project

MMDVM: Results and Ongoing Work

- **Results**

- Expanded cross-mode capabilities
- Built embedded AMBE server functionality
- Advanced MMDVM-TNC capabilities

- **Ongoing work**

- Finalize cross-mode integration
- Refine embedded AMBE server
- Enhance MMDVM-TNC features



MMDVM: Priorities

- **Other priorities**
 - Integrate MQTT functionality
 - Port firmware to newer dev environment
 - Deprecate outdated firmware



MMDVM: Future Work

- **Future work**
 - Develop I/Q radio capabilities
 - Support for new modes (dPMR, TETRA, FM)
 - Firmware for STM32H723 board with SX1255 / STM32WL33 RF chips



MMDVM: Talk to Us!



- Visit our booth: *Building 2 (Tesla), Booth 2805*
- Interested in becoming a code contributor?
 - Let us know!
- Email:
 - Jim: ki6zum@gmail.com
- Website: mmdvm.com



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Rhizomatica



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What is Rhizomatica?

- US non-profit (est. 2010) supporting community infrastructure worldwide
- Primary focus: energy and communications
- HERMES (2017): Open-source digital HF system for long distance communication in hard-to-reach-areas
 - Ongoing work in Ecuadorian and Brazilian Amazon, Central African Republic, and Bangladesh



R H I Z O M A T I C A



Rhizomatica: HERMES

- Full-stack digital HF system that supports voice and data communication
 - Email, file transfer, etc.
- Free download
- With Mercury (Rhizomatica's soft modem) and the intuitive graphic interface, anyone can get started with digital HF
- For more information: <https://hermes.radio/>



Rhizomatica: Talk to Us!



- Visit our booth: *Stall 9951 in Flea Market*
- Join our HERMES mailing list and contribute:
 - Testing, writing code, suggesting features
 - List: <https://lists.riseup.net/www/info/hermes-general>
- Email:
 - Peter: peter@rhizomatica.org
 - Rafael: rafael@rhizomatica.org



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Thank you, Grantees!

Interested in applying for a grant?

[https://www.ardc.net/apply/
giving@ardc.net](https://www.ardc.net/apply/giving@ardc.net)



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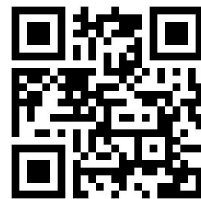
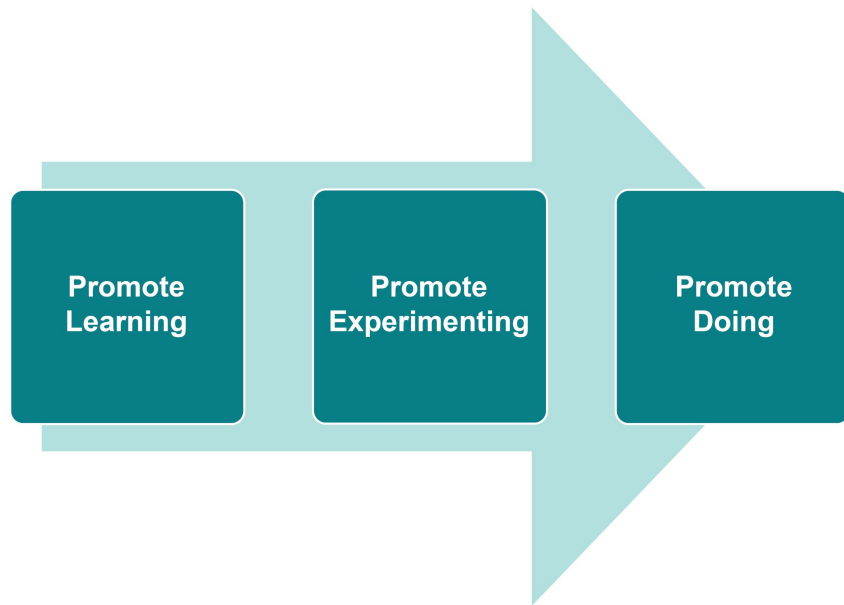
Join in!

Experiment with 44Net!

- Get IPv4 addresses at our booth!

Learn and **Do** by getting involved with projects from our grantees

Apply for a grant!



Talk to Us!



Booth: *Building 1 (Maxim) #1302*

Email:

- Grants: giving@ardc.net
- 44Net and general: contact@ardc.net



2024 Annual Report

- Grants (incl. GET findings)
- Tech & 44Net
- Operations
- Staff & Board arrivals, departures
- Staff & Volunteers lost in 2024
- Communications/Outreach

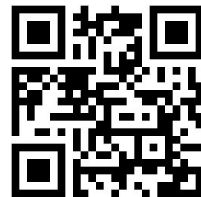
2024 Annual Report

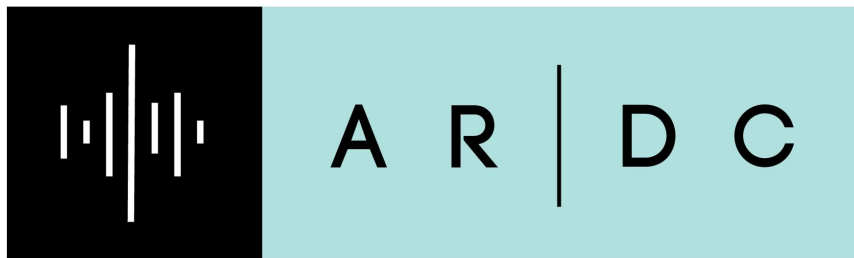
Amateur Radio Digital Communications



AMATEUR RADIO DIGITAL COMMUNICATIONS

5663 Balboa Ave. STE 432 | San Diego, CA | 92111-2705 USA





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Thank you!

Reach out any time: contact@ardc.net

